Popular Science Summary

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Deep Hedging of CVA: A Novel Approach to Managing Financial Risk

In the complex world of finance, banks and financial institutions engage in numerous transactions daily, many of which involve significant risks. One such risk is the credit risk — the danger that a counterparty in a financial contract may fail to fulfill their obligations. To manage this risk, financial institutions use a metric known as *Credit Valuation Adjustment* (CVA), which adjusts the risk of credit exposure in derivatives portfolios. However, protecting against losses from changes in credit risk — known as hedging CVA — is a challenging task that requires sophisticated mathematical tools and financial strategies.

This thesis introduces an innovative approach to hedge CVA using deep learning algorithms. Traditional methods often fall short in capturing the complexities of market behaviors and the intricacies involved in credit changes. By harnessing the power of advanced machine learning techniques, specifically reinforcement learning algorithms, this research develops models that can dynamically hedge CVA based on evolving market conditions.

The essence of this work lies in its ability to construct hedging strategies under various market scenarios without the need for solving complicated sets of equations. This is possible by simulating markets using stochastic models — mathematical frameworks that incorporate randomness and uncertainty. These models aid in understanding how different factors in the financial markets interact and influence each other, thereby providing a robust basis for the deep learning algorithms to operate.

Moreover, the thesis not only proposes a theoretical framework but also tests these strategies through extensive simulations. These simulations demonstrate the potential of deep learning in enhancing the accuracy and efficiency of CVA hedging. The results are promising, showing that deep learning models can outperform traditional methods, leading to more effective risk management and potentially lower financial losses.

In conclusion, this thesis not only contributes an application of deep learning to the field of financial risk management but also opens up new avenues for future research. It underscores the increasing relevance of artificial intelligence in finance, suggesting that as markets evolve, so too must our strategies for managing risk, leveraging the latest technological advancements to tackle old and new challenges alike.